Now, while these sounds were audible to human ears, it may be fairly believed that they would have been readily detected by the woodpecker, which may be often observed to halt suddenly on its way up a pine trunk. This *trait* in the mode of climbing is noticeable more or less in all the insectivorous climbers, and appears to me to be caused partly by the bird listening for the sounds produced by insects either in the bark or in the wood. I noticed this particularly in the case of the great black woodpecker (*P. pileatus*) or "log-cock," as it is named in Canada. It would suddenly stop on its way up a tree trunk, and after remaining perfectly motionless for a short time, commence to attack the bark and wood with great vehemence. Every one who has travelled in North American forests will have observed how the excavations made by woodpeckers are often confined to one side of a tree, or to particular situations. And not only on decayed parts, but, as in the case of the extremely tough cedar (*T. occidentalis*), where openings of several inches in circumference have been made through several inches of perfectly fresh wood in order to reach the decaying central layers where wood-eating beetles deposit their eggs and the animal is matured. Admitting that it may have been induced to dig out the insect by tracing the external opening inwards, still in the case of the larvæ the wandering from its birth-place, and the sounds consequent on the tunnelling process, would assuredly be heard by a bird whose ears had been trained to such delicate noises through the necessities of its mode of life. I can therefore well believe that auscultation is of great service to such birds, and also to nocturnal species in discovering their prey. A. LEITH ADAMS

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### Tapeworm in Rabbits

I WOULD suggest that the tapeworm referred to by Mr. G. J. Romanes is like the Bothriocephalus of man—perhaps a species of the same genus. This is not supposed to have a cystic state, but to be developed from a ciliated embryo taken into the system on raw or badly-cooked vegetables, which have been watered by sewage from cesspools, in which the eggs will remain alive for months.

In the same way the eggs of the rabbit's tape-worm probably remain in the animal's droppings till set free in rain as ciliated embryos. As the rabbit feeds on the vegetation watered by such rain, there is no difficulty in understanding how the embryos would reach his alimentary canal. R. D. TURNER

### Meteor of January 7, 10.31 P.M.

THE fine meteor mentioned in NATURE, vol. xv. p. 244, and also seen by Mr. W. H. Wood, p. 295, was observed by many other persons; and as your correspondent asks for another observation of it, the following may be useful:—"J. L. M'C.," writing from Putney Hill, London, says: "As near as I could judge, it appeared between the stars Castor and Pollux ($\alpha$ and $\beta$ Geminorum), and its course lay almost due north-east, passing over the stars $\lambda$ and $\psi$ Ursæ Majoris, and disappearing a little beyond the latter star. It was of great brightness, left a tail of fire in its wake about two degrees in length, and was visible some ten seconds." This account, compared with the other two referred to, stands as follows:—

| Place. | Meteor. Begun R.A. | Begun Decl. | Ended. R.A. | Ended. Decl. | Length of path. | Duration in seconds. |
|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | ° | |
| London | 153 | + 43 | 200 | + 31 | 39 | Very slow. |
| W. H. Wood, Birmingham | 130 | + 5 | 182 | + 16 | 52 | 5½ |
| J. L. M'C., Putney Hill, London | 113 | + 31 | 170 | + 46 | 46 | 10 |

From these paths the radiant point comes out near $\gamma$ Eridani, R.A. 58°, Decl. S., 12°, and I can confirm this position from other meteors seen in January, including one as bright as Venus, on the 4th, 8.51 P.M., which exhibited the same slow, halting motion as that noted in regard to the fine one seen on the 7th. I have read other accounts of the latter, but they are mostly vague. At Bermondsey it was seen at 10.30, and described as large and remarkably brilliant, closely resembling in size and colour the meteor which appeared on September 24, 1876. It was of a bluish colour, left a long tail or streak of light in its wake, and its course in the heavens was from south-west to north-east. At 10.37 on the same evening a very large, brilliant meteor was seen at Lower Clapton, and this, no doubt, refers to the same object.

Mr. Barrington (NATURE, vol. xv. p. 275) notes another bright meteor, at 6 P.M., on January 19, but its apparent path shows it to have been different to the one seen by a correspondent at Wolverhampton, at 6.27, January 19, who writes that he witnessed a meteor of "unusual magnitude and brilliancy. It moved almost perpendicularly, in a southerly direction, very slowly, the time occupied in its passage being about seven or eight seconds."

Ashley Down, Bristol W. F. DENNING

## *THE UNITED STATES GEOGRAPHICAL AND GEOLOGICAL SURVEY OF THE WESTERN TERRITORIES UNDER DR. F. V. HAYDEN*

### *Explorations in* 1876.

WE have been furnished with some early notes upon the results of the work of Dr. Hayden's survey during the past year, from which we make the following extracts:—

"For reasons beyond the control of the geologist in charge, the various parties composing the United States Geological and Geographical Survey of the Territories did not commence their field-work until August. Owing to the evidences of hostility among the northern tribes of Indians, it was deemed most prudent to confine the labours of the survey to the completion of the Atlas of Colorado. Therefore the work of the season of 1876 was a continuation of the labours of the three preceding years, westward, finishing the entire mountainous portion of Colorado, with a belt of fifteen miles in width of northern New Mexico, and a belt twenty-five miles in breadth of Eastern Utah. Six sheets of the Physical Atlas are now nearly ready to be issued from the press. Each sheet embraces an area of over 11,500 square miles, or a total of 70,000 square miles. The maps are constructed on a scale of four miles to one inch, with contours of two hundred feet, which will form the basis on which will be represented the geology, mines, grass, and timber lands, and all lands that can be rendered available for agriculture by irrigation. The areas of exploration of the past season are located in the interior of the continent, far remote from settlements, and among the hostile bands of Ute Indians that attacked two of the parties the previous year."

The force was divided by Dr. Hayden into four parties. The first, for primary triangulation, under Mr. A. D. Wilson, with Mr. Holmes as artist and geologist, accomplished the survey of an area of about 1,000 square miles. The second, or Grand River party, under Mr. Garnett as topographer, and Dr. Peale as geologist, surveyed about 3,500 square miles. The third, or White River Division, with Mr. Chittenden as topographer, and Dr. Endlich as geologist, spent forty-eight days in absolute field-work, and reports a surveyed area of 3,800 square miles, in the accomplishment of which 1,000 miles of traverse were made, while forty-one main topographical stations and sixteen auxiliary ones were established. The fourth, or Yampah party, conducted by Mr. Bechler, topographer, assisted by Dr. White, geologist, surveyed about 3,000 square miles. Thus, during the two months of last autumn, these active explorers surveyed about 11,300 square miles of territory (that is more than the whole of the southern or lowland part of Scotland) with sufficient accuracy and detail to permit of the construction of a general map on this scale of four miles to an inch, and with contour lines at successive elevations of 200 feet to mark the main topographical features. Fortunately the geological structure is of extreme simplicity, otherwise such rapid and useful work would be impossible. Dr. Hayden and his associates are doing good service by making known in this way the main features of those vast territories, leaving the details to be worked out at a later time.

Among the most interesting geological results obtained last year are some additional particulars regarding the brackish water-beds lying at the base of the tertiary rocks of these western territories. Three new species of

*Unio* were found, making six in all, now known to occur in these strata.

"They are all of either distinctively American types or closely related to species now living in American fresh waters. They represent by their affinities the following living species:—*Unio clavus*, Lamarck; *U. securis*, Lea; *U. gibbosus*, Barnes; *U. metaneorus*, Rafinesque; and *U. complanatus*, Solander. They are associated in the same stratum with species of the genera *Corbula*, *Corbicula*, *Neritina*, *Viviparus*, &c., and which stratum alternates with layers containing *Ostrea* and *Anomia*. The close affinity of these fossil *Unios* with species now living in the Mississippi river and its tributaries, seems plainly suggestive of the fact that they represent the ancestry of the living ones. An interesting series of facts has also been collected, showing that some of the so-called American types of *Unio* were introduced in what is now the great Rocky Mountain region as early as the Jurassic period, and that their differentiation had become great and clearly defined as early as late Cretaceous and early Tertiary times. Other observations suggest the probable lines of geographical distribution, during the late geological periods of their evolutional descent, by one or more of which they have probably reached the Mississippi river system, and culminated in the numerous and diverse forms that now exist there.

"The work of the past season shows very clearly the harmonious relations of the various groups of strata over vast areas, that although there may be a thickening or a thinning out of beds at different points, they can all be correlated from the Missouri river to the Sierra Nevada basin. The fact also that there is no physical or palæontological break in these groups over large areas from the Cretaceous to the Middle Tertiary, is fully established. The transition from marine to brackish water forms of life commences at the close of the Cretaceous epoch, and without any line of separation that can yet be detected, continues on upward until only purely fresh-water forms are to be found. Dr. White, an eminent palæontologist and geologist, says that the line must be drawn somewhere between the Cretaceous and Tertiary epochs, but that it will be strictly arbitrary, as there is no well-marked physical break to the summit of the Bridger group." A. G.

## *ALLOY OF PLATINUM AND IRIDIUM FOR A NEW METRIC STANDARD OF LENGTH*

THE Warden of the Standards has, in his valuable annual reports, described the steps which have been taken to secure new International Metric Standards, and Mr. Chisholm has also given abundant information as to the various points of interest connected with their preparation and preservation. The advantage of employing an alloy of platinum and iridium appears to have been so conclusively demonstrated that the French Chamber granted, in November, 1875, 260,000 francs (10,400*l.*) for the expenses of constructing the new International Prototype Standards, and, of this sum, 257,500 francs were required for the cost of an alloy containing 90 per cent. of platinum, and 10 per cent. of iridium, of which they were to be made.[1]

The preparation of a bar for a standard of length has been undertaken for the Association Géodésique Internationale by Messrs. Johnson, Matthey and Co., who presented the results of their labours to the Academie des Sciences on December 4 last.[2] The platinum and iridium used were prepared by the processes of MM. St. Claire Deville and Debray, and they were analysed in their laboratory before fusion. Mr. George Matthey thus describes the method by which this difficult task was accomplished. Five ingots were prepared by melting together in each case 450 ounces of platinum and 55 ounces of iridium. These were then cut in small pieces by the aid of an hydraulic press, and the fragments melted together and kept fluid by a flame of coal gas and oxygen. The ingot obtained was laminated, cut into strips, and again melted into an ingot, which appeared to be very homogeneous and free from roughness or visible flaws. This ingot was forged into a bar 35 cm. long, 7·5 cm. wide, and 2·5 cm. thick. The greater part of this was repeatedly annealed and rolled between polished cylinders of steel until it was 4·10 metres long, 21 mm. wide, and 5 mm. thick, which were very nearly the required dimensions. Then a perfectly rectangular form was imparted to the rule by means of a "drag-bench," and the finishing was effected by a planing machine, as the alloy, owing to its extreme hardness, removed iron from the plates through which it was drawn.

After Mr. Matthey's communication had been read, M. St. Claire Deville gave the result of a careful examination to which he had submitted the bar. He found that the alloy in the form of an ingot has a density 21·508 at 0° C., an oblong mass cut from the bar, was found to be, after annealing, of the density 21·516, which showed that when annealed, at a high temperature, the metal assumes very nearly the density of the fused metal. It was proved by analysis to contain—

| | I. | | II. |
|---|---|---|---|
| Platinum ... ... ... | 89·40 | ... | 89·42 |
| Iridium ... ... ... | 10·16 | ... | 10·22 |
| Rhodium ... ... ... | ·18 | ... | ·16 |
| Ruthenium ... ... ... | ·10 | ... | ·10 |
| Iron ... ... ... | ·06 | ... | ·06 |
| | 99·90 | ... | 99·96 |

From which the following figures were deduced:—

| | Proportion. | Density at 0 C. | Volume. |
|---|---|---|---|
| Platinum Iridium at 10 per cent. | 99·33 | 21·575 | 4·603 |
| Iridium in excess ... ... ... | 0·23 | 22·380 | 0·010 |
| Rhodium ... ... ... ... ... | 0·18 | 12·000 | 0·015 |
| Ruthenium ... ... ... ... | 0·10 | 12·261 | 0·008 |
| Iron ... ... ... ... ... ... | 0·06 | 7·700 | 0·008 |
| | 99·90 | | 4·644 |

Density at 0° C. calculated from analysis No. I. = 21·510
" " " " No. II. = 21·515

which agree perfectly with the results of the analyses, and with regard to them it should be pointed out, that it is very difficult to purify platinum and iridium, and that the smallness of the amounts of rhodium and ruthenium present affords additional evidence of the care with which the refining was performed. It is well known that all substances capable of being tempered, such as glass and steel, change their dimensions in time, others which become crystalline with changes of temperature, as zinc does, are in the same case. The researches of Mr. Wild have shown that hyalite, a variety of opal, appears to be free from this mobility of form, and consequently of density. With facts such as these in view, M. St. Claire Deville proposes to make certain experiments in conjunction with M. Mascart, to determine whether platinum-iridium is subject to a permanent change of volume or not.

The work upon which the accuracy of standards depends is of the highest importance, and Mr. Matthey has well sustained the reputation of this country for technical skill. Metallurgists will appreciate his success, for they can recognise the difficulty he has had to contend with in the fusion and working of such an alloy, but for those who are less familiar with the conditions which had to be met, we would quote the graceful words of MM. Dumas and Deville. The former observed: "Il a exécuté ce travail avec un succès complet sous le double rapport de la composition exacte de l'alliage et de la forme de la règle . . . . l'intérêt actuel est évident, et la production enrichit l'outillage scientifique d'un alliage doué de propriétés précieuses." M. Deville said: "Qu'il me soit permis, en terminant, de remercier le métallurgiste habile, le savant distingué, M. G. Matthey, qui a accompli son œuvre avec un talent et un désintéressement qui ne seront pas perdus pour la science."

W. CHANDLER ROBERTS

[1] Tenth Annual Report of the Warden of the Standards, 1876, p. xxxiv.
[2] *Comptes Rendus*, No. 23, 1876, p. 1,090.